

High Efficiency, High Temperature Foam Core Heat Exchanger for Fission Surface Power Systems, Phase I

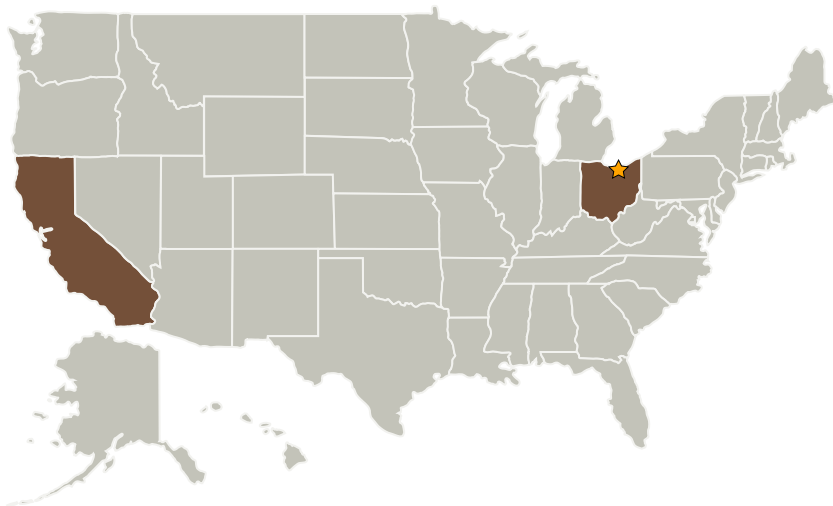
Completed Technology Project (2008 - 2008)



Project Introduction

Fission-based power systems are anticipated for various planetary surface human base applications with power levels of 30-100+ kWe. The development of high temperature, high efficiency heat exchangers, turbines, and pumps is critical for next-generation nuclear power and space propulsion systems. High temperature heat exchangers are required for nuclear reactors to operate above 1000 K and take advantage of improved Brayton cycle efficiency at high inlet temperatures. In previous work for the Department of Energy involving fusion reactor components, Ultramet demonstrated the capability of an innovative heat exchanger composed of a highly porous, open-cell refractory metal foam coolant channel enclosed within a solid refractory metal shell of the same material. High heat flux testing with helium coolant was performed at the Sandia National Laboratories Plasma Materials Test Facility. A component survived heat flux levels up to 22.36 MW/m² (2236 W/cm²). The turbulence created by flowing helium coolant through highly porous open-cell foam dramatically increased heat transfer relative to a conventional open coolant channel. Foam core heat exchanger technology is anticipated to substantially improve power conversion efficiency of liquid metal-to-gas, high temperature heat exchangers for fission surface power systems. Ultramet proposes to team with Sandia to design a component and demonstrate initial feasibility.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Ultramet	Supporting Organization	Industry	Pacoima, California

Primary U.S. Work Locations

California	Ohio
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Brian J Williams

Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.4 Advanced Propulsion
 - └ TX01.4.1 Solar Sails